

## 641-2400 (60-260) Arm Model

**Introduction:** The human arm is a masterpiece of engineering, even more impressive than the arms of other primates. While analogous to the forelimbs of quadrupeds, it is much more developed. The human arm is capable of an incredible range of motion, while retaining enough strength to allow tasks such as climbing. The secret to the strength and dexterity of the arm is in the clever arrangement of bone and muscle.

The shoulder joint is of the ball and socket variety, but is designed to allow a tremendous range of motion, up to 360° in some individuals. It is also strong enough to support an individual's body weight. The bones in the forearm are able to twist around each other, allowing for a high level of flexibility in the wrist. This allows humans and apes to have a great deal of manual dexterity. The upper arm bone, or *humerus*, is very strong and can easily be loaded to up to 300lbs with little risk of breaking. Surrounding these bones is an arrangement of muscles.

Most of the arm muscles are concerned with range of motion, such as the positioning of the hands and wrists. Two are primarily responsible for flexing the arm: the *biceps* and *triceps*. The biceps is the stronger of the two and is the primary flexor of the elbow. The triceps is responsible for bringing the arm back into a straight position. While lifting strength is not primarily concentrated in these muscles, without them the arm would be unable to flex, and thus be useless.

**Operation:** Your arm model is designed to show the interplay of the biceps and triceps, and their role in flexing the arm. Muscles can pull but not push, which is why two are needed to move the arm in two directions. Muscles pull by becoming shorter. This stretches tendons to move a joint.

Your arm model has been set up to simulate the effects of muscles. You will notice there are 7 pegs; two in the 'shoulder', three in the forearm, one in the elbow, and one in the wrist. The model is mounted on a post which must be placed into a socket on the included base. This provides a stable platform and allows the arm to swing freely. Rubber bands are a good choice for simulating muscles because of their elastic nature.

To simulate the triceps, run a rubber band from peg E to peg F. You will notice that the arm will immediately straighten. This is the purpose of the triceps: to extend the arm straight. It is a flexor and not primarily a lifting muscle.



To simulate the biceps, run a rubber band from peg from peg A to any of the pegs in the forearm. Peg B indicates a weaker biceps, while peg D indicates a strong biceps. The biceps is a flexor that curls the arm upward, and it is a lifting muscle as well. Contrary to popular belief, the biceps is not the strongest muscle in the arm, nor even the primary lifter. That distinction belongs to the brachialis muscle.

If you hook up the biceps and triceps simultaneously, be sure to use a thicker rubber band for the biceps muscle. The biceps is inherently stronger, but the triceps has better leverage. This tends to even them out. Try to attach rubber bands in such a way that the two muscles are completely balanced against each other.

**Warranty and Parts:**

We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain small parts that can be choking hazards. Adult supervision is required.